Scientific Papers. Series D. Animal Science. Vol. LXVIII, No. 2, 2025
ISSN 2285-5750; ISSN CD-ROM 2285-5769; ISSN Online 2393-2260; ISSN-L 2285-5750

NEW DATA FOR HELMINTH FAUNA OF *Hyla arborea* Linnaeus, 1758 (Amphibia) IN THE REPUBLIC OF MOLDOVA

Elena GHERASIM, Dumitru ERHAN

Institute of Zoology, SUM, Republic of Moldova

Corresponding author email: gherasimlenuta@gmail.com

Abstract

In this paper data are reflected with reference to the structure of the helminthic fauna of Hyla arborea Linnaeus, 1758 in dependence on intrinsic and extrinsic factors. The carried out helminthological research allowed the identification of 13 helminth species, including 7 species of trematodes, 5 species of nematodes and one species of acanthocephalans. The quantitative evaluation of annual parasitological indices shows that the infestation with the trematode species Opisthioglyphe ranae was recorded in 28.42 ± 0.15%, Pleurogenes claviger - in 20.14 ± 0.10%, Pleurogenoides medians - in 25.90 ± 0.27%, Diplodiscus subclavatus - in 20.86 ± 0.06%, Strigea sphaerula, mtc. - in 17.99 ± 0.18%, Neodiplostomum major, mtc. in 15.47 ± 0.44%, Strigea falconis, mtc. in 14.75 ± 1.80%, with Cosmocerca ornata in 30.22 ± 0.25%, Oswaldocruzia filiformis in 23.74 ± 0.28%, Oswaldocruzia duboisi in 20.14 ± 0.07%, Icosiella neglecta in 21.58 ± 0.11%, Agamospirura sp. II, larva - in 18.35 ± 0.17%, and Acanthocephalus ranae was recorded in 23.74 ± 0.02% of cases.

Key words: *Hyla arborea, helminth fauna, parasitological indices, Republic of Moldova.*

INTRODUCTION

Knowledge of the situation of the spread of parasitic invasions has always been at the centre of attention of specialists in the field, both in our country and in other regions of the world. Until 1992, it was stated that the spread of parasitic invasions reflects on a global scale the relationship between host and parasite - conditioned by the phylogenetic and ontogenetic development under the condition's ecological conditions. Some parasites may be common throughout a country, but others are present not only in certain areas but also at certain times.

Knowledge is required for the correct orientation of surveillance, prevention and control measures for all parasites and, in particular, for the dominant parasites, not in general, but in concrete terms (Gherasim, 2023; Olteanu, 2001).

One of the main problems in the prevention of parasitic diseases is the huge number of species of parasitic agents. Currently, according to specialized sources, more than 5000 species of nematodes, about 3000 species of trematodes, more than 1000 species of monogeneans, about 1800 species of cestodes and more than 300 species of acanthocephalans are known (Erhan, 2020).

In the Republic of Moldova, 38 helminth species have been described in cattle, including 4 trematodes, 6 cestodes and 28 nematodes; in sheep 40 species, including 3 trematodes, 7 cestodes and 30 nematodes; in pigs - 15 species, including 2 trematodes, 3 cestodes and 10 nematodes; in dogs – 14; cats - 12; chickens - 20; and in amphibians - 16 helminth species (Erhan, 2020; Gherasim, 2020).

The species *Hyla arborea* being the only arboreal species of amphibians in Europe, inhabiting deciduous and mixed forests, shady and relatively humid sectors with rich tufa and grass cover throughout the republic, plays a particularly important role in regulating the number of phytophagous invertebrates, which make up 71.7% of its daily food ration (Boaghie et al., 2025; Cîrlig et al., 2023; Cozari & Gherasim, 2024).

Helminthological researches of this amphibian species worldwide are being studied (Yakar et al., 2016; Düşen, 2009), and in the Republic of Moldova for the first time.

MATERIALS AND METHODS

The helminthological investigations of the amphibian species *Hyla arborea* were carried out in the period 2013-2024 throughout the territory of the Republic of Moldova. For the

purpose of helminthological researches in total, individuals of two age classes were captured: prereproductive (embryos, larvae, juveniles) and reproductive (adults), so that, their population structure did not show any changes related to the population.

A total of 462 adult specimens of *Hyla arborea* were helminthologically assessed, of which 230 males and 232 females, 205 juveniles and 293 larvae.

In order to evaluate the structure of the helminth fauna of *Hyla arborea* the specimens were suppressed with 4% formalin. After devitalization, the amphibians were placed on a flat surface and fixed with preparation needles (Fuhn, 1960).

The methods used in the diagnosis of parasitic agents in amphibians were of two types: direct and indirect. Thanks to the fact that parasitic agents have a very varied localization, as a result of devitalization and dissection of amphibians all organs were investigated.

The method of complete helminthologic autopsy according to academician Konstantin Skryabin (1928) is the most accurate, but time-consuming, because it requires examination of all organs and tissues in the body of amphibians without exception to extract all detected helminths.

The internal organs were examined by wet (by successive washings) and dry methods. The dry method consisted of crushing each organ progressively harder between bottles until transparent and viewing it under a magnifying glass without opening and washing. In some cases, the wet and dry methods were combined.

In order to quantify the characteristic of contamination of amphibians with helminths and to obtain information about the spread, severity, distribution of helminths in the host population (in amphibians) and to determine the impact on the host, the main helminthological indices of intensivity (II, specimens) - the minimum and maximum number of parasites of a species and extensivity (EI, %) - the percentage of contamination of the host by a parasite species were evaluated (Erhan et al., 2024; Gherasim et al., 2024).

For the purpose of describing and assessing the interactions and associations between parasites and the different age structures of amphibians, the Pearson correlation coefficient (r_{xy}) was calculated between the parasite variable and the body mass of amphibian larvae and juveniles, as well as the body mass of their adult forms (Erhan et al., 2024).

The correlation coefficient r has values between -1 and 1. If r_{xy} has the sign +, it indicates a perfect positive correlation, i.e. a perfect positive linear relationship between the variables. If r_{xy} has the sign -, it indicates a perfect negative correlation, i.e. a perfect negative relationship between the variables. The closer the correlation coefficient is to +1 or -1, the stronger the correlation. On the contrary, if r_{xy} is close to zero, it is considered that a correlation defined by a linear functional dependence cannot exist between the variables x and y (Erhan et al., 2024).

RESULTS AND DISCUSSIONS

The structure of the helminth fauna of *Hyla arborea* is characterized by the presence of 13 species of helminths, including 7 species of trematodes, 5 species of nematodes and one species of acanthocephalans.

Quantitative evaluation of parasitological indices in *Hyla arborea* shows that infestation with the trematode species *Opisthioglyphe ranae* occurred in 28.42 ± 0.15% of cases (II - 2.14 ex.), infestation with the species *Pleurogenes claviger* occurred in 20.14 ± 0.10% of cases (II - 2.98 ex.), infestation with the species *Pleurogenoides medians* occurred in 25.90 ± 0.27% of cases (II - 6.93 ex.), infestation with *Diplodiscus subclavatus* occurred in 20.86 ± 0.06% of cases (II - 1.67 ex.), infestation with *Strigea sphaerula*, mtc. occurred in 17.99 ± 0.18% of cases (II - 8.20 ex.), infestation with *Strigea sphaerula*, mtc. occurred in 17.99 ± 0.18% of cases (II - 8.20 ex.), infestation with *Neodiplostomum major*, mtc. was recorded in 15.47 ± 0.44% of the cases (II - 6.65 ex.), and infestation with *Strigea falconis*, mtc. was recorded in 14.75 ± 1.80% of the cases (II - 75.68 ex.) (Figure 1).

Quantitative analysis of parasitological indices in *H. arborea* shows that infestation with the nematode *Cosmocerca ornata* occurred in 30.22 ± 0.25% of cases (II - 9.29 ex.), infestation with *Oswaldocruzia filiformis* occurred in 23.74 ± 0.28% of cases (II - 8.61 ex.), infestation with the species

Oswaldocruzia duboisi was recorded in 20.14 ± 0.07% of cases (II - 2.32 ex.), infestation with the species *Icosiella neglecta* was recorded in 21.58 ± 0.11% of cases (II - 4.47 ex.), infestation with the nematode species *Agamospirura* sp. *II*, larvae was recorded in 18.35 ± 0.17% of cases (II - 5.43 ex.), and the evaluation of parasitological indices in *H. arborea* with the acanthocephalan species *Acanthocephalus ranae* was recorded in 23.74 ± 0.02% of cases (II - 1.08 ex.) (Figure 1).

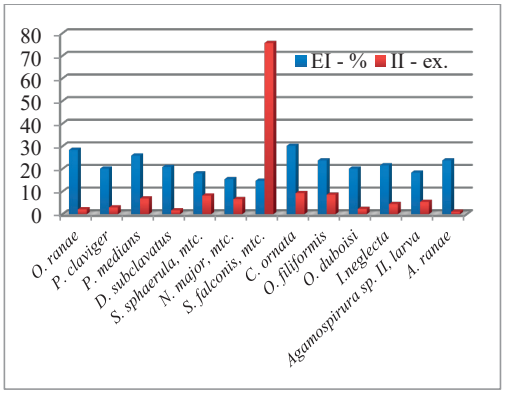

Figure 1. Degree of helminth infestation of *Hyla arborea* Linnaeus, 1758

Evaluation of the structure of the helminth fauna of the amphibian species *Hyla arborea* and the degree of helminth infestation of these species allowed us to conclude that parasite infestation is realized depending on host-specific biological and ecological factors.

A no less important role in the infestation of amphibians with parasitic agents is their importance in the food chain, so that amphibians being an indispensable component of ecosystems as prey and predator, have a particular contribution in the numerical regulation of different invertebrate species, and are also an indispensable trophic source for certain vertebrate species (Gherasim et al., 2024).

The evolution of mono- and polyparasitism in different groups of animals can be caused by both host environmental factors and the its phylogeny.

According to our helminthologic investigations carried out in the amphibian species *H. arborea* infestation in monoinvasion aspect was recorded in 16.5% of cases and in polyinvasion aspect was recorded in 83.5% of cases (Figure 2).

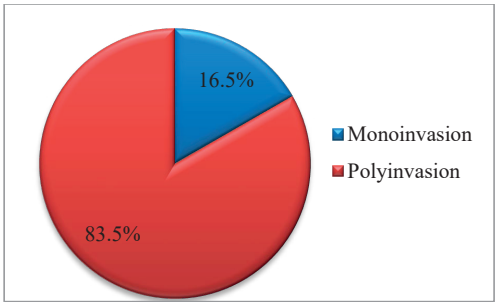

Figure 2. Structure of the helminthic fauna of the species *Hyla arborea* in terms of mono- and polyinvasions

For the purpose of the complex assessment of the helminth fauna of amphibians, the degree of helminth infestation of amphibians in mono- and polyinvasion aspect in relation to host genus was also determined.

Therefore, according to our data it was determined that males of the amphibian species H. arborea are infested in monoinvasion aspect in 15% of cases and in polyinvasion aspect in 85% of cases, and females are infested in monoinvasion aspect in 18.3% of cases and in polyinvasion aspect in 81.7% of cases (Figure 3).

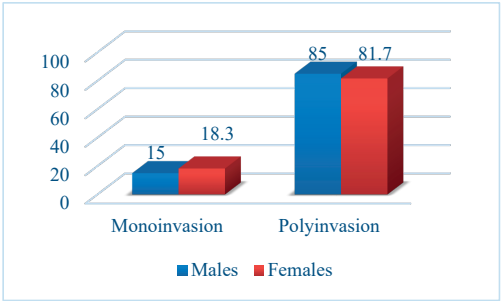

Figure 3. Structure of the helminthic fauna of the species *Hyla arborea* in terms of mono- and polyinvasion depending on the host gender

Therefore, the helminthological results obtained on the infestation of the host species H. arborea in mono- and polyinvasion aspect allowed us to establish that both in males and females these predominates infestation in polyinvasion aspect.

In the process of evolution, various organisms including helminths have adapted to develop in

various organs and organ systems in animals and humans (Erhan D., 2020).

In order to determine the structure of the helminthic fauna of *H. arborea* species, it was found that they are infested concomitantly with various species of parasitic agents, and this process is the result of their interrelations with biological diversity. Thus, the process of polyparasitism was manifested in associations consisting of 2 species - 29% of cases, 3 species - 40.7% of cases, 4 species - 24.2% of cases, and 5 species - 6.1% of cases.

At the same time, the evaluation of the obtained data allowed us to conclude that the possibility of concurrent infestation of a single host (amphibians) with several species of parasitic agents reflects the trophic relationships in the ecosystem (prey-predator) specific to amphibians, but at the same time their coinfection process demonstrates the increased degree of amphibians in vectorization of common parasitic agents of wild, domestic, pet and human animals (Erhan & Gherasim, 2022; Gherasim et al., 2024).

Nevertheless, however, there is a dearth of research addressing the effect of metamorphic or post-metamorphic age on the susceptibility of amphibians to parasitic agent infestation (Abu Bakar et al., 2016; Lamirande & Nichols, 2002; Langhammer et al., 2014)

The study of the dependence of the helminth fauna on host age is a major issue in ecological parasitology. A closer attention to the level of parasite infestation in dependence on the age of the host is given in the works of Dogheli (Gherasim et al., 2024; Erhan et al., 2024).

Host age may play an important role in determining both the risk and outcome of pathogen exposure in many disease systems. Infected hosts are often not evenly distributed across the ages of wild populations, as even small differences in host competence can lead to an abnormal distribution of parasites or pathogens (Hudson et al., 2006).

In this regard, we investigated how susceptibility to helminth infestation in the pre-reproductive stage (embryos, larvae, juveniles) varied considerably with the post-metamorphosis reproductive stage, specifically supporting the hypothesis that amphibians are susceptible to infestation with various parasitic agents as soon as they begin larval development.

The helminthological examination of embryos of the amphibian species *Hyla arborea* did not show the presence of invasive elements. However, a low taxonomic diversity of the amphibian larvae was established as the instar develops and shows direct contact with the aquatic environment, which is a function of the duration of embryonic development, which can vary from 40 to 45 days. Thus, according to the helminthological data obtained, it was established that the larvae of the amphibian species *Hyla arborea* are infested with 3 species of helminths depending on the host host season. Thus, the infestation with the trematode species *O. ranae* was recorded in 25.93% of the cases with an invasion intensity of 1.00 ex., and the infestation with the trematode species *S. falconis*, mtc. and *S. sphaerula* was recorded in 62.79% of the cases (II - 1.00 ex.) each (Figure 4).

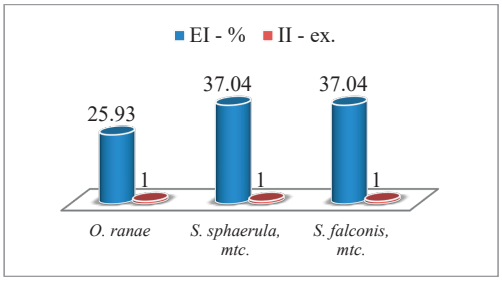

Figure 4. Degree of helminth infestation of *Hyla arborea* larvae

In amphibians in our country, larval development is completed with the complete metamorphosis and the emergence of juveniles on land. As the juveniles leave the aquatic basins in which they developed, they adapt to a different living environment in which the diversity of fauna is also different, and as a result their trophic ration changes, becoming more varied (Cozari & Gherasim, 2024).

According to the helminthological researches carried out on juveniles of *H. arborea* species with the nematode species *Cosmocerca ornata* was recorded in 34.15 ± 0.13% of cases (II - 2.21 ex.), infestation with the species *Oswaldocruzia filiformis* was recorded in 31.71% of cases (II - 1.00 ex.), and infestation with the species *Icosiella neglecta* was recorded in 9.76% of cases (II - 1.00 ex.) (Figure 5).

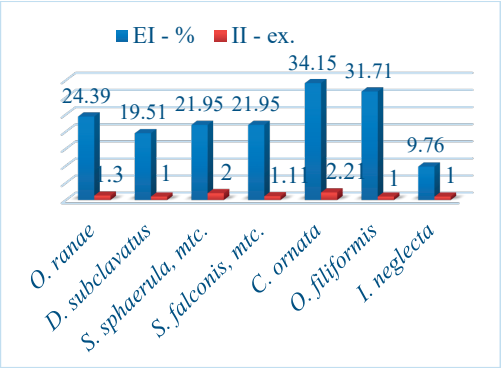

Figure 5. Degree of invasion of juveniles of the species *Hyla arborea* Linnaeus, 1758

According to the Pearson's coefficient (r_{xy}) evaluation at all age structures of H. arborea species, it was determined that the Pearson's coefficient (r_{xy}) indicates a perfect positive correlation (-1, +1) between the degree of helminth infestation and the body mass of amphibian larvae, juveniles and adults.

These scientific data obtained confirm the existence of a linear relationship between infestation and amphibian body mass, or as amphibian body mass increases, so does the diversity of their helminth fauna. One of the main factors contributing to the increase in amphibian body mass is age. This perfect correlation suggests that nutritional factors at different ontogenetic periods directly influence both amphibian weight gain and the structure of their helminth fauna in a comprehensible way (Figure 6).

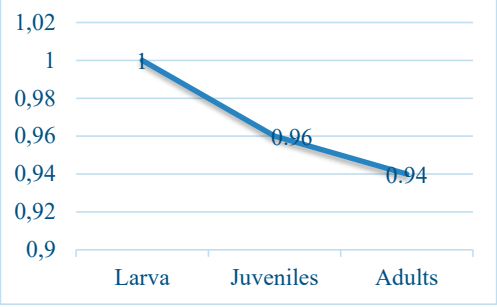

Figure 6. Pearson correlation coefficient for the species *Hyla arborea*

Therefore, according to the obtained results it was established that one of the main factors contributing to the formation of a parasitic structure of *H. arborea* is the age of the species. The older the age of the host, the more time it had to contact with the parasite. Therefore, the extensivity and intensivity of invasion for many helminth species changes, increasing with the age of the *H. arborea* species (larvae, juveniles, adults).

At the same time, age-related changes are often associated with changes in host body structure, behavior or nutritional spectrum, which also leads to a change in the probability of infection (Gherasim et al., 2024).

In conclusion, the obtained results demonstrate that host age affects the susceptibility of *H. arborea* species to infection with various parasitic agents, thus, the larval and immediately post-metamorphic (juvenile) stage was least susceptible to adult form helminths, thus susceptibility increases as amphibians age, which is due to the food chain. At the same time, the susceptible state of *H. arborea* species of different age structures proves that they can become susceptible hosts as they age.

In the vast majority of cases, within the same group of hosts, with the same lifestyle, parasite infestation is different. The reason for this difference can be explained by the mechanism of relationship formation in the host-parasite system. The viability of parasitic agents in relation to individual host differences related to phenology (coming out of hibernation stations) and ethology of amphibians (territory occupancy in breeding lakes) increase the heterogeneous probability of infestation with parasitic agents. Differences in parasite fauna between individuals of different sexes are less common and their causes are less clear. Most parasites are evenly distributed between members of different sexes, although sometimes there is a short-term preference for one sex (Gherasim et al., 2024).

Helminthological research on the amphibian species *Hyla arborea* in dependence on host gender allowed us to determine a highly significant probability between the degree of helminth infestation of males compared to females, especially with the trematode species *O. ranae* with 1.77% of cases (td – 5.90; $P < 0.001$), *P. medians* - with 7.78% (td – 39.29; $P < 0.001$), *C. ornata* - with 9.80% (td – 18.32; $P < 0.001$), *O. duboisi* - with 4.89% (td – 40.61; $P < 0.001$), *Agamospirura* sp. II - with 5.82% (td – 15.85; $P < 0.001$) and with the *Acanthocephala* species *A. ranae* - with 3.03% (td – 67.75; $P < 0.001$) and with the species

Agamospirura sp. II - with 17.07% (td – 4.98; P < 0.001) of cases (Table 1).

Table 1. Degree of helminth infestation of *Hyla arborea* species depending on host gender

No.	Invasion	Males (n=230) M ± m	Females (n=232) M ± m	Difference	
				d	P
CLASA TREMATODA					
1	*Opisthioglyphe ranae*	29.25 ±0.18	27.48 ±0.24	-1.77	< 0.001
2	*Pleurogenes claviger*	23.81 ±0.14	16.03 ±0.14	-7.78	< 0.001
3	*Pleurogenoides medians*	25.85 ±0.38	25.95 ±0.37	0.10	> 0.05
4	*Diplodiscus subclavatus*	19.05 ±0.08	22.90 ±0.10	3.85	< 0.001
5	*Strigea sphaerula, mtc.*	16,33 ±0,26	19.85 ±0.26	3.52	< 0.001
6	*Neodiplostomum major, mtc.*	14.97 ±0.72	16.03 ±0.49	1.06	> 0.05
7	*Strigea falconis, mtc.*	17.01 ±2.29	12.21 ±2.89	-4.80	> 0.05
CLASA SECERNENTEA					
8	*Cosmocerca ornata*	34.69 ±0.33	25.19 ± 0.40	-9.50	< 0.001
9	*Oswaldocruzia filiformis*	21.09 ±0.40	26.72 ± 0.39	5.63	< 0.001
10	*Oswaldocruzia duboisi*	22.45 ±0.08	17.56 ± 0.09	-4.89	< 0.001
11	*Icosiella neglecta*	20.41 ±0.15	22.90 ± 0.16	2.49	< 0.001
12	*Agamospirura sp. II, larva*	21.09 ±0.18	15.27 ± 0.32	-5.82	< 0.001
CLASA PALAEACANTHOCEPHALA					
13	*Acanthocephalus ranae*	25.17 ±0.02	22.14 ± 0.04	-3.03	< 0.001

Note: * - P < 0.05 (S); ** - P < 0.01 (S);
*** - P < 0.001 (IS); P > 0.05 (NS)

Therefore, the helminthological researches carried out on the species of amphibians, depending on the host genus, as well as the quantitative analysis of the data allowed us to conclude that the diversity of the helminth fauna and the degree of infestation with parasitic agents depend on the species of the helminth, the host species and the host genus.

CONCLUSIONS

For the first time in the Republic of Moldova, helminthological research was carried out on the species of caudate amphibians *Hyla arborea*, and the results of the investigations established their infestation with 13 species of helminths, including 7 species of trematodes, 5 species of nematodes and one species of acanthocephala.

The evaluation of the structure of the helminthic fauna in the amphibian species *Hyla arborea* and the degree of its helminth infestation allowed us to conclude that infestation with parasitic agents occurs depending on host-specific biological and ecological factors.

The evaluation of the structure of the helminthic fauna in the amphibian species *Hyla arborea* and the degree of helminth infestation of it allowed us to conclude that infestation with parasitic agents occurs depending on the biological and ecological factors specific to the host, and according to our helminthological investigations carried out, it was established that the species *H. arborea* is infested with helminths predominantly in the form of polyinvasions 83.5% of cases.

In order to determine the diversity of the helminthic fauna of the *H. arborea* host depending on the age of the host, specimens from the pre-reproductive and reproductive age classes were helminthologically evaluated. Thus, in the larvae of the *H. arborea* species, the infestation of their larvae with 3 species of helminths was established, in the juveniles, the infestation with 7 species of helminths was established, and in the adult forms, the infestation with 13 species of helminths was established. According to the evaluation of the Pearson coefficient at all age structures of the species *H. arborea*, it was established that the Pearson coefficient is a perfect positive correlation between the degree of helminth infestation and the body mass of larvae, juveniles and adult forms.

Therefore, the results obtained demonstrate that the age of the host affects the susceptibility of the *H. arborea* species to infection with various parasitic agents, such that the larval and immediately post-metamorphic stage (juveniles) were the least susceptible to adult helminths, thus the sensitivity increases as the amphibians age, which is due to the trophic chain. At the same time, the susceptible state of the *H. arborea* species of different age structures proves that they can become susceptible hosts as they age.

ACKNOWLEDGEMENTS

This research work was carried out with the support of framework of the postdoctoral project “Helminthic fauna of amphibians (Amphibia), their importance as vectors in the

formation and maintenance of parasitic zoonoses" no. 23.00208.7007.05/PDII, the project "Evaluation of the structure and functioning of animal world and aquatic ecosystems under the influence of biotic and abiotic factors in the context of ensuring ecological security and the well-being of the population" no. 010701

REFERENCES

Abu Bakar, A., Bower, D.S., Stockwell, M.P., Clulow, S., Clulow, J., & Mahony, M.J. (2016). Susceptibility to disease varies with ontogeny and immunocompetence in a threatened amphibian. *Oecologia, 181*(4), 997-1009.

Boaghie, D., Cîrlig, M., Cozari, T., Gherasim, E., Nistreanu, V., Bulmachiu, G., Miron, A., Tofan-Dorofeev, E., Ioniță, O., Bejan, I., & Bunduc, T. (2025). *Annals of Nature*. Chișinău, MD: Tipografia Centrală Publishing House.

Cîrlig, M., Cozari, T., Bușmachiu, G., Gherasim, E., Nistreanu, V., Miron, A., Tofan-Dorofeev, E., Ioniță, O., Covali, V., Grati, V., Bejan, I., Bunduc (Popușoi), T., Angheluța, V., Jechiu, I., Guceac, I., Cușnir, I., Rotaru, A., Ciobanu, I., Hadârcă, D., & Mărgineanu, A. (2023). *Orhei National Park Management Plan*. Chișinău, MD: Impresuum Publishing House.

Cozari, T., & Gherasim, E. (2024). Ecological and ethological aspects of amphibians in Orhei National Park. Chișinău, MD: Tipografia Centrală Publishing House.

Düşen, S. (2009). Helminth Parasites of the Tree Frog, Hyla arborea (Anura: Hylidae) from Southwest Turkey. *Comparative Parasitology*, 71, 258-261, 10.1654/4123.

Erhan, D. (2020). *Treatment of associated parasitosis of domestic animals*. Chișinău, MD: Tipografia Centrală Publishing House.

Erhan, D., & Gherasim, E. (2022). *Helminthic fauna of amphibians and reptiles of the Republic of Moldova. Trematoda*, Vol. 1. Chișinău, MD: Tipografia Centrală Publishing House.

Erhan, D., Roșcov, E., & Gherasim, E. (2024). *Mathematical modeling of epizootic processes in parasitic diseases. In: Parasites, parasitism and their impact on the environment*. Chișinău, MD: Tipografia Centrală Publishing House.

Fuhn, I. (1960). R.P.R. Fauna, Vol. XIV, fasc.I: Amphibia. Bucharest, RO: Academia Romana Publishing House.

Gherasim, E. (2023b). The role of amphibians in maintaining parasitic zoonoses (Trematodosis) in fish in the Republic of Moldova. *Scientific papers. Series D. Animal science, LXVI*(1), 561-566.

Gherasim, E. (2020). *Pelophylax ridibundus* (Amphibia: Ranidae) as paratenic host of Spirocerca lupi species (Secernentea: Spirocercidae) in the Republic of Moldova. *Lucrări ştiinţifice. Seria Medicină Veterinară*, 63/1, 18-24.

Gherasim, E., & Erhan, D. (2024). *Helminthic fauna of amphibians and reptiles of the Republic of Moldova. Trematoda*, Vol. 2. Chișinău, MD: Tipografia Centrală Publishing House.

Hudson, P. J., Dobson, A. P., & Lafferty, K. D. (2006). Is a healthy ecosystem one that is rich in parasites? *Trends in ecology & evolution*, *21*(7), 381-385.

Lamirande, E., & Nichols, D. (2002). Effects of host age on the susceptibility to cutaneous chytridiomycosis in blue-and-yellow poison dart frogs (Dendrobates tinctorius). In: McKinnell R, Carlson D, editors. *Proceedings of the sixth international symposium on the pathology of reptiles and amphibians*, 3-16.

Langhammer, P.F., Burrowes, P.A., Lips, K.R., Bryant, A.B., & Collins, J.P. (2014). Susceptibility to the amphibian chytrid fungus varies with ontogeny in the direct-developing frog *Eleutherodactylus coqui*. *J. Wildl. Dis., 50*(3), 438-46.

Olteanu, G. (2001). *Polyparasitism in humans, animals, plants and the environment*. Bucharest, RO: Ceres Publishing House.

Skryabin, K.I. (1928). Metod polnykh gel'mintologicheskikh vskrytiy pozvonochnykh zhivotnykh, vklyuchaya cheloveka. M. 45 str.

Yakar, O. D., Sinan, Y., & Hikmet, B. S. (2016). Gastrointestinal helminths of the oriental tree frog Hyla orientalis Bedriaga, 1890 (Amphibia: Hylidae) from Izmir Province, Western Turkey. *Acta Zoologica Bulgarica, 68*(1), 111-115.